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(54) Title: PERSONAL CARE COMPOSITIONS CONTAINING OIL-SOLUBLE FILM-FORMING POLYMER AND ADHESIVE ELASTOMERIC POLYMER

(57) Abstract: The present invention relates to skin care compositions containing an oil-soluble film-forming polymer and an oil-soluble adhesive elastomeric polymer and to methods of using such compositions to regulate the appearance of skin and/or hair. The compositions contain from about 0.1% to about 70% of an oil-soluble film-forming polymer having a Tg of greater than 25°C, from 0.1% to about 70% of an oil-soluble adhesive elastomeric polymer having a Tg of less than 40°C, and a dermatologically acceptable carrier.

PERSONAL CARE COMPOSITIONS CONTAINING OIL-SOLUBLE FILM-FORMING POLYMER AND ADHESIVE ELASTOMERIC POLYMER

TECHNICAL FIELD

The present invention relates to topical personal care compositions and methods of use thereof. The compositions contain polymers, particularly oil-soluble film-forming polymers in combination with an adhesive elastomeric polymer. Such compositions are useful for modifying the appearance of skin and/or hair, especially for regulating visible and/or tactile discontinuities in skin associated, e.g., with skin aging.

BACKGROUND

Many personal care products currently available to consumers are directed primarily to improving the health and/or physical appearance of the skin and/or hair. Among the skin care products, many are directed to delaying, minimizing or even eliminating skin wrinkling and other histological changes typically associated with the aging of skin or environmental damage to human skin. Numerous compounds have been described in the art as being useful for regulating skin condition, including regulating fine lines, wrinkles and other forms of uneven or rough surface texture associated with aged or photodamaged skin.

Skin and hair are subject to insults by many extrinsic and intrinsic factors. Extrinsic factors include ultraviolet radiation (e.g., from sun exposure), environmental pollution, wind, heat, low humidity, harsh surfactants, abrasives, and the like. Intrinsic factors include chronological aging and other biochemical changes from within the skin or hair follicle. Whether extrinsic or intrinsic, these factors result in visible signs of skin aging and environmental damage, such as wrinkling and other forms of roughness (including increased pore size, flaking and skin lines), and other histological changes associated with skin aging or damage. To many people, skin wrinkles are a reminder of the disappearance of youth. As a result, the elimination of wrinkles has become a booming business in youth-conscious societies. Treatments range from cosmetic creams and moisturizers to various forms of cosmetic surgery.

Extrinsic or intrinsic factors may result in the thinning and general degradation of the skin. For example, as the skin naturally ages, there is a reduction in the cells and blood vessels that supply the skin. There is also a flattening of the dermal-epidermal junction which results in weaker mechanical resistance of this junction. See, for example, Oikarinen, "The Aging of Skin:

Chronoaging Versus Photoaging," *Photodermatol. Photoimmunol. Photomed.*, vol. 7, pp. 3-4, 1990, which is incorporated by reference herein in its entirety.

A large number of skin care actives are known in the art and used to improve the health and/or physical appearance of the skin. For example, salicylic acid and benzoyl peroxide are used in skin care compositions to treat acne. Retinol and other retinoids are known for use in skin care compositions to reduce signs of aging skin. Although formulating skin care compositions with such actives provide skin care benefits, there is often a significant lag time between when the product is applied and when visible results are perceived by the consumer. This lag time can lead to consumer frustration and discontinuation of product use.

Products directed to using stress (for example, created by a film on the skin) to smooth facial wrinkles currently exist on the marketplace. For example, a wrinkle-smoothing product is currently available which contains the anionic polymers sodium dextran sulphate and bovine serum albumin. Products such as this do provide a limited reduction of the appearance of wrinkles when applied to the skin. However, some of these products are generally brittle, glassy, and/or water-sensitive when applied to the surface of the skin. Due to these properties, as soon as the consumer moves their facial muscles (such as to blink or smile), the product fractures. The fracturing can cause many disadvantages, including loss of the wrinkle reduction benefit, and often also causes a highly undesirable visible whiteness or other negative aesthetic. Several hours after application, the visual appearance of facial wrinkles can often be worse than before the application of product as a result of, for example, unsightly peeling, fracture and/or whiteness of the material. Perspiration and humidity also may cause a degradation of any original application benefit.

Based on the foregoing, there is a continuing need to formulate skin care compositions which improve the physical appearance of the skin, which are effective in providing an immediate visually perceived benefit in the physical appearance of skin, without fracturing or peeling from the skin.

SUMMARY

The present invention relates to a composition containing from about 0.1% to about 70%, by weight of the composition, of an oil-soluble, film-forming polymer having a Tg of greater than 25°C; from about 0.1% to about 70%, by weight of the composition, of an adhesive elastomeric polymer having a Tg of less than 40°C; and a dermatologically acceptable carrier.

The present invention also relates to methods of using such compositions to modify the appearance of skin and/or hair. Said methods generally contain the step of topically applying

(either together or in sequence) a safe and effective amount of the individual elements of the composition to the skin and/or hair of a mammal needing such treatment.

The present invention also relates to methods of using such compositions to style hair, especially human facial hair (eyebrows, eyelashes). Such methods generally contain the step of topically applying to the hair of a mammal in need of treatment, a safe and effective amount of such compositions.

The present invention also relates to a personal care kit useful for modifying the appearance of skin or hair containing an oil-soluble-film-forming polymer having a Tg greater than 25°C and an adhesive elastomeric polymer having a Tg of less than 40°C.

These and other features, aspects, and advantages of the present invention will become evident to those skilled in the art from a reading of the present disclosure.

DETAILED DESCRIPTION

While the specification concludes with the claims particularly pointing and distinctly claiming the invention, it is believed that the present invention will be better understood from the following description.

All percentages and ratios used herein are by weight of the total composition and all measurements made are at 25°C, unless otherwise designated.

The compositions of the present invention can comprise, consist essentially of, or consist of, the components of the present invention as well as other ingredients described herein. As used herein, "consisting essentially of" means that the composition or component may include additional ingredients, but only if the additional ingredients do not materially alter the basic and novel characteristics of the claimed compositions or methods.

All publications cited herein are hereby incorporated by reference in their entirety.

The term "keratinous tissue," as used herein, refers to keratin-containing layers disposed as the outermost protective covering of mammals (e.g., humans, dogs, cats, etc.) which includes, but is not limited to, skin, lips, hair, toenails, fingernails, cuticles, hooves, etc.

The term "dermatologically-acceptable," as used herein, means that the compositions or components thereof so described are suitable for use in contact with mammalian keratinous tissue without undue toxicity, incompatibility, instability, allergic response, and the like.

The term "safe and effective amount" as used herein means an amount of a compound or composition sufficient to significantly induce a positive benefit, preferably a positive keratinous tissue appearance or feel benefit, or positive hair appearance or feel benefit, including independently or in combinations the benefits disclosed herein, but low enough to avoid serious

side effects, i.e., to provide a reasonable benefit to risk ratio, within the scope of sound judgment of the skilled artisan.

The term "sagging" as used herein means the laxity, slackness, or the like condition of skin that occurs as a result of loss of, damage to, alterations to, and/or abnormalities in dermal elastin.

The terms "smoothing" and "softening" as used herein mean altering the surface of the keratinous tissue such that its tactile feel is improved.

"Signs of skin aging" include, but are not limited to, all outward visibly and tactilely perceptible manifestations as well as any other macro or micro effects due to skin aging. Such signs may be induced or caused by intrinsic factors or extrinsic factors, e.g., chronological aging and/or environmental damage. These signs may result from processes which include, but are not limited to, the development of textural discontinuities such as wrinkles and coarse deep wrinkles, skin lines, crevices, bumps, large pores (e.g., associated with adnexal structures such as sweat gland ducts, sebaceous glands, or hair follicles), or unevenness or roughness, loss of skin elasticity (loss and/or inactivation of functional skin elastin), sagging (including puffiness in the eye area and jowls), loss of skin firmness, loss of skin tightness, loss of skin recoil from deformation, discoloration (including undereye circles), blotching, sallowness, hyperpigmented skin regions such as age spots and freckles, keratoses, abnormal differentiation, hyperkeratinization, elastosis, collagen breakdown, and other histological changes in the stratum corneum, dermis, epidermis, the skin vascular system (e.g., telangiectasia or spider vessels), and underlying tissues, especially those proximate to the skin.

As discussed above, products containing polymers and directed to smoothing facial wrinkles currently exist on the marketplace. However, upon application and subsequent drying on the skin, some of these products generally become brittle, glassy, and/or water-sensitive. Because of these properties, the products often result in disadvantages such as an undesirable visible whiteness. A need therefore exists to formulate skin care compositions which improve the physical appearance of the skin and which are effective in providing an immediate visually perceived benefit in the physical appearance of skin such as, for example, without fracturing or peeling of the product from the skin.

Surprisingly, it has now been found that compositions containing a combination of an oil-soluble film-forming polymer having a Tg of greater than 25°C and an adhesive elastomeric polymer having a Tg of less than 40°C, provide substantially immediate visual benefits in regulating skin condition and styling hair previously unrecognized in the art of which the present inventors are aware. For example, topical applications of an oil-soluble film-forming polymer

and an adhesive elastomeric polymer provide controlled delivery of physical stress on the skin or hair while simultaneously accomplishing adhesion and flexibility such that the effect is both acute and sustained, for example, over time, such as over the course of the daytime (8 hours). For example, when applied to skin, topical applications of the oil-soluble film-forming polymer and adhesive elastomeric polymer can provide a texture and firming effect, while when applied to hair, the effect is a styling advantage (e.g. smoothing hair, curling eyelashes). Additionally, the effect of applying oil-soluble film-forming polymer and adhesive polymer to the skin can work for virtually all visible skin texture discontinuities (e.g. wrinkles, fine lines, under eye bags and dark circles, sagging skin, scars/marks, dimples, pores, stretch marks, roughness, skin surface, frown lines, expression lines, rhytides, blemishes, photodamage, crevices, and unevenness). Without being limited by theory, it is believed that the adhesive elastomeric polymer protects the oil-soluble film-forming polymer film from fracturing or otherwise breaking, and adheres the oil-soluble polymer film to the skin or hair. It is also believed that the texture reduction (e.g. wrinkle smoothing and/or hair styling effect is a result of the oil-soluble film-forming polymer film coating the skin or hair and the physical stress creation caused by the drying of the polymer mixture.

Generally, the compositions herein are applied to the skin and/or hair and allowed to dry. For example, when applied to the skin, as the composition dries, stress is created on the skin, causing the wrinkled skin (or other discontinuity) to be pulled flat and thereby appear diminished. Also for example, when applied to the hair, as the composition dries, stress is created on the hair shaft causing a curling or styling effect. The effect on hair can, for example, result in the curling of eyelashes, especially when applied as part of a mascara cosmetic application.

None of the existing art provides all of the advantages and benefits of the present invention.

The compositions of the present invention are also useful for physically regulating the condition of skin and especially for regulating keratinous tissue condition. Regulation of skin condition, namely mammalian and in particular human skin condition, is often required due to conditions which may be induced or caused by factors internal and/or external to the body. Examples include, environmental damage, radiation exposure (including ultraviolet radiation), chronological aging, menopausal status (e.g., post-menopausal changes in skin), stress, diseases, etc. For instance, "regulating skin condition" includes prophylactically regulating and/or therapeutically regulating skin condition, and may involve one or more of the following benefits: thickening of skin (i.e., building the epidermis and/or dermis and/or sub-dermal (e.g., subcutaneous fat or muscle) layers of the skin and where applicable the keratinous layers of the

nail and hair shaft) to reduce skin atrophy, increasing the convolution of the dermal-epidermal border (also known as the rete ridges), preventing loss of skin elasticity (loss, damage and/or inactivation of functional skin elastin) such as elastosis, sagging, loss of skin recoil from deformation; non-melanin skin discoloration such as under eye circles, blotching (e.g., uneven red coloration due to, e.g., rosacea) (hereinafter referred to as "red blotchiness"), sallowness (pale color), discoloration caused by telangiectasia or spider vessels.

As used herein, prophylactically regulating skin condition includes delaying, minimizing and/or preventing visible and/or tactile discontinuities in skin (e.g., texture irregularities in the skin which may be detected visually or by feel).

As used herein, therapeutically regulating skin condition includes ameliorating, e.g., diminishing, minimizing and/or effacing, discontinuities in skin.

The compositions of the present invention are also useful for improving skin appearance and/or feel. For example, compositions of the present invention are useful for regulating the appearance of skin condition by providing an immediate visual improvement in skin appearance following application of the composition to the skin. The compositions of the present invention are also useful for styling hair. For example, the compositions of the present invention are useful for curling hair, especially eyelashes.

The compositions of the present invention contain an oil-soluble film-forming polymer having a Tg of greater than 25°C, an adhesive elastomeric polymer having a Tg of less than 40°C, and a dermatologically acceptable carrier. The compositions herein may also include a wide variety of other ingredients.

The compositions of the present invention, are described in detail hereinafter.

I. Oil-Soluble Film-Forming Polymer

The topical compositions of the present invention include from about 0.1% to about 60%, preferably from about 1% to about 50%, more preferably from about 3% to about 40%, even more preferably from about 5% to about 25%, by weight of the composition, of an oil-soluble, film-forming polymer having a Tg of greater than 25°C.

The term "glass transition" or "Tg" is a known term of art in polymer science used to describe the temperature at which a polymer or portion thereof undergoes a transition from a solid or brittle material to a liquid or rubber-like material. Glass transition temperatures can be measured using standard techniques that are well known to the polymer scientist of ordinary skill in the art. One useful technique for determining glass transitions is differential scanning calorimetry (also known as DSC). A differential scanning calorimeter, measures a change in enthalpy with a change in time, dH/dt, as a function of programmed temperature T. The glass

transition phenomenon in polymers is described in *Polymer Handbook, Third Edition* (eds. J. Brandrup and E. H. Immergut), (John Wiley & Sons, Inc.: 1989), which is incorporated by reference herein in its entirety.

By "film-forming" as used herein is meant that the oil-soluble polymer is capable of forming a film when spread onto glass and allowed to dry at ambient temperature. Preferably, the oil-soluble polymer is capable of forming a continuous film when dried on the glass.

The oil-soluble film-forming polymer may be selected from alkyds, shellacs, polystyrene, organosiloxane resins, and mixtures thereof.

Preferably, the oil-soluble film-forming polymers have a Tg of from about 25°C to about 750°C, more preferably from about 50°C to about 600°C.

Preferred oil-soluble film-forming polymers for use herein include film-forming organosiloxane resins having a Tg of greater than 25°C. The organosilioxane resins contain $R_3SiO_{1/2}$ "M" units, R_2SiO "D" units, $RSiO_{3/2}$ "T" units, and/or SiO_2 "Q" units. Preferably, the "M", "D", "T", and/or "Q" units are selected to satisfy the relationship $R_nSiO_{(4-n)/2}$ where n is a value between 1.0 and 1.50 and R is a C_1 to C_{12} lower alkyl group. Preferably, R is a methyl group. A small amount, up to 5%, of silanol or alkoxy functionality may also be present in the resin structure as a result of processing. Preferably, the resin is soluble in organic solvents such as toluene, xylene, isoparaffins, and cyclosiloxanes or the volatile carrier, indicating that the resin is not tightly crosslinked. Particularly preferred are resins comprising repeating monofunctional or $R_3SiO_{1/2}$ "M" units and the quadrafunctional or SiO_2 "Q" units, otherwise known as "MQ" resins.

Commercially available organosiloxane resins useful herein include Wacker MQ (Wacker-Belsil TMS) and WACKER MT resins available from Wacker Silicones Corporation of Adrian, Michigan; GE MQ (including GE SR1000 and SS4267) from the General Electric Company; and DOW CORNING MQ, (DC593) available from Dow Corning.

A preferred oil-soluble film-forming polymer for use herein is poly(trimethylsiloxysilicate).

II. Oil-Soluble Adhesive Elastomeric Polymer

The compositions of the present invention include from about 0.1% to about 70%, preferably from about 0.5% to about 50%, more preferably from about 1% to about 40%, even more preferably from about 2% to about 40%, by weight of the composition, of an oil-soluble adhesive elastomeric polymer having a Tg value of less than 40°C.

By "elastomeric" is meant that the polymer has an elastic modulus such that the copolymer exhibits a resistance to deformation and has limited extensibility and retraction. Preferably, the polymer generally may be stretched to at least 30% of the original length and return to approximately the original length when released.

By "adhesive" is meant that when applied as a solution to a surface and dried, (e.g., the skin) the polymer adheres to the surface. Preferably upon drying on the skin, the polymer adheres to the skin. More preferably, the polymer forms films or welds on the skin.

Suitable oil-soluble adhesive elastomeric polymers include linear copolymers, branched copolymers, random copolymers, block copolymers, di-block copolymers, tri-block copolymers, multi-block copolymers, grafted copolymers, and/or star-shaped copolymers of the following: styrene-isoprene elastomers, styrene-butadiene elastomers, styrene-ethylene/propylene-styrene elastomers, styrene-ethylene/butylene-styrene elastomers, terminal hydroxylated polyethylene/butylene elastomers, ethylene-propylene elastomers, random thermoplastic elastomers, polystyrene-co-polyethylenepropylene elastomers, and mixtures thereof.

Additionally, grafted copolymers in the above list may also be used in the present invention. For example, grafts (such as t-butyl styrene) onto the polymers listed above may be used in the present invention.

Preferably, the oil-soluble adhesive elastomeric polymers have a Tg of from about -200°C to 40°C, more preferably from about -150°C to about 10°C.

Preferred are the oil-soluble adhesive elastomeric copolymers selected from styrene-isoprene linear copolymers, styrene-isoprene branched copolymers, styrene-isoprene di-block, tri-block, or star shaped copolymers, and mixtures thereof.

Examples of commercially available oil-soluble adhesive elastomeric polymers also include styrene-isoprene copolymer elastomers such as KRATON LVSI-101 and KRATON D2224P, styrene-butadiene elastomers such as KRATON D, styrene-ethylene/propylene-styrene or styrene-ethylene/butylene-styrene elastomers such as KRATON G and KRATON FG1901X, terminal hydroxylated polyethylene/butylene elastomers such as KRATON L-2203 and KRATON L1203, all available from the Shell Oil Company.

Examples of commercially available oil-soluble adhesive elastomeric polymers include branched di-block or tri-block or star-shaped copolymer elastomers of ethylene-propylene such as KRATON D1116, KRATON D1124, KRATON G1750X, KRATON G1765X, all available from the Shell Oil Company.

Additionally, water soluble elastomers can be incorporated in addition to the oil soluble elastomers such as styrene-acrylate elastomer latexes such as the HYSTRETCH series, e.g.

HYSTRETCH v43 (available from B.F. Goodrich), silicone elastomer latexes such as DC74166 (available from Dow Corning), acrylic acid ester elastomer latexes such as GELVA 2333 (available from Monsanto) and HYCAR (available from B.F. Goodrich), and styrene-butadiene elastomer latex such as GOODRITE (available from B.F. Goodrich).

Preferred oil-soluble adhesive elastomeric polymers for use herein are styrene-isoprene copolymer elastomers.

III. Dermatologically-Acceptable Carrier

The topical compositions of the present invention also include from about 1% to about 99.8%, by weight of the composition, of a dermatologically acceptable carrier for the oil-soluble film-forming polymer and the oil-soluble adhesive elastomeric polymer. The phrase "dermatologically-acceptable carrier", as used herein, means that the carrier is suitable for topical application to the keratinous tissue, has good aesthetic properties, is compatible with the actives of the present invention and any other components, and will not cause any untoward safety or toxicity concerns. Preferably, the composition includes from about 20% to about 90%, by weight of the composition, of the dermatologically acceptable carrier.

Examples of suitable dermatologically acceptable carriers for use herein include volatile organic solvents, water, polar solvents, ketones, aromatic hydrocarbons, aliphatic hydrocarbons, silicone solvents, aliphatic alcohols, diacetone alcohol, esters, alcohols, glycols, glycol ethers, aromatics. A preferred solvent is an organic hydrocarbon solvent. Mixtures of dermatologically acceptable carriers may also be used herein. A preferred mixture is a silicone solvent with an organic hydrocarbon solvent.

Examples of aliphatic hydrocarbons useful herein include isododecane, isohexadecane, and isopropylmyristate. Examples of silicone solvents useful herein include cyclomethicone, dimethiconol, and dimethicone. Examples of ketones useful herein include hexane/methyl ethyl ketone blends and methyl isobutyl ketone. Examples of alcohols useful herein include isopropyl alcohol and those with similar properties. Examples of volatile organic solvents useful herein include hydrocarbon oils, silicone oils, and mixtures thereof. A preferred volatile carrier is isododecane.

The carrier can be in a wide variety of forms. The carrier may be a single solvent, a mixture of solvents, a propellant/solvent mixture, or the carrier may be, for example, in the form of an emulsion. Emulsion carriers useful herein include, microemulsions, oil-in-water, water-in-silicone, water-in-oil, water-in-oil-in-water, and oil-in-water-in-silicone emulsions. Preferred carriers for use herein include single solvents and combinations of solvents. Preferred emulsion

carriers include water-in-silicone, water-in-oil, and oil-in-water emulsions. As will be understood by the skilled artisan, a given component will distribute primarily into either the water or oil/silicone phase, depending on the water solubility/dispersibility of the component in the composition.

Emulsifiers may also be used in the emulsion forms of the present invention. Suitable emulsifiers are disclosed in, for example, U.S. Patent 3,755,560, issued August 28, 1973, Dickert et al.; U.S. Patent 4,421,769, issued December 20, 1983, Dixon et al.; and McCutcheon's Detergents and Emulsifiers, North American Edition, pages 317-324 (1986).

Preferred water-in-silicone and oil-in-water emulsions are described in greater detail below.

A) Water-in-silicone emulsion

Water-in-silicone emulsions contain a silicone phase and a dispersed aqueous phase.

(1) Silicone phase

Preferred water-in-silicone emulsions of the present invention contain from about 1% to about 60%, preferably from about 2% to about 40%, by weight of the composition, of a silicone phase.

The silicone phase contains a polyorganosiloxane oil. The silicone phase of these preferred emulsions may contain up to 50%, by weight of the silicone phase, of organopolysiloxane oil and between about 50% and about 99.9%, by weight of the silicone phase, of a non-silicone oil. Water-in-silicone emulsions of this type are described in PCT Application WO 97/21423, published June 19, 1997.

The organopolysiloxane oil for use in the composition may be volatile, non-volatile, or a mixture of volatile and non-volatile silicones. The term "nonvolatile" as used in this context refers to those silicones that are liquid under ambient conditions and have a flash point (under one atmospheric of pressure) of or greater than about 100°C. The term "volatile" as used in this context refers to all other silicone oils. Suitable organopolysiloxanes can be selected from a wide variety of silicones spanning a broad range of volatilities and viscosities. Examples of suitable organopolysiloxane oils include polyalkylsiloxanes, cyclic polyalkylsiloxanes, and polyalkylarylsiloxanes.

Commercially available polyalkylsiloxanes include the polydimethylsiloxanes, which are also known as dimethicones, examples of which include the Vicasil® series sold by General Electric Company and the Dow Corning® 200 series sold by Dow Corning Corporation.

Commercially available cyclomethicones include Dow Corning® 244 fluid having a viscosity of 2.5 centistokes, and a boiling point of 172°C, which primarily contains the cyclomethicone tetramer (i.e. n=4), Dow Corning® 344 fluid having a viscosity of 2.5 centistokes and a boiling point of 178°C, which primarily contains the cyclomethicone pentamer (i.e. n=5), Dow Corning® 245 fluid having a viscosity of 4.2 centistokes and a boiling point of 205°C, which primarily contains a mixture of the cyclomethicone tetramer and pentamer (i.e. n=4 and 5), and Dow Corning® 345 fluid having a viscosity of 4.5 centistokes and a boiling point of 217°, which primarily contains a mixture of the cyclomethicone tetramer, pentamer, and hexamer (i.e. n=4, 5, and 6).

Dimethiconols are also suitable for use in the composition. Commercially available dimethiconols are typically sold as mixtures with dimethicone or cyclomethicone (e.g. Dow Corning® 1401, 1402, and 1403 fluids). Polyalkylaryl siloxanes are also suitable for use in the composition.

Examples of non-silicone oils suitable for use in the continuous silicone phase are those well known in the chemical arts in topical personal care products in the form of water-in-oil emulsions, e.g., mineral oil, vegetable oils, synthetic oils, semisynthetic oils, etc.

(2) Aqueous phase

The topical compositions of the present invention may, in some embodiments, contain from about 0.1% to about 90%, preferably from about 0.5% to about 50%, more preferably from about 1% to about 20%, by weight of the composition, of an aqueous phase.

The aqueous phase can be water, or a combination of water and one or more water soluble or dispersible ingredients. Nonlimiting examples of such ingredients include thickeners, acids, bases, gums, water-soluble or dispersible alcohols and polyols, buffers, preservatives, sunscreening agents, colorings, and the like.

(3) Emulsifier

The water-in-silicone emulsions of the present invention may, in some embodiments, contain from about 0.1% to about 10%, by weight of the composition, of an emulsifier. The emulsifier helps disperse and suspend the aqueous phase within the continuous silicone phase.

A wide variety of emulsifying agents can be employed herein to form the preferred water-in-silicone emulsion. Known or conventional emulsifying agents can be used in the composition, provided that the selected emulsifying agent is chemically and physically compatible with components of the composition of the present invention, and provides the desired dispersion characteristics. Suitable emulsifiers include silicone emulsifiers, non-silicon-containing

emulsifiers, and mixtures thereof, known by those skilled in the art for use in topical personal care products.

Useful silicone emulsifiers include dimethicone copolyols. These materials are polydimethyl siloxanes which have been modified to include polyether side chains such as polyethylene oxide chains, polypropylene oxide chains, mixtures of these chains, and polyether chains containing moieties derived from both ethylene oxide and propylene oxide. Other examples include alkyl-modified dimethicone copolyols, i.e., compounds which contain C_2-C_{30} pendant side chains.

Nonlimiting examples of dimethicone copolyols and other silicone surfactants useful as emulsifiers herein include polydimethylsiloxane polyether copolymers with pendant polyethylene oxide sidechains, polydimethylsiloxane polyether copolymers with pendant polypropylene oxide sidechains, polydimethylsiloxane polyether copolymers with pendant mixed polyethylene oxide and polypropylene oxide sidechains, polydimethylsiloxane polyether copolymers with pendant mixed poly(ethylene)(propylene)oxide sidechains, polydimethylsiloxane polyether copolymers with pendant organobetaine sidechains, polydimethylsiloxane polyether copolymers with pendant carboxylate sidechains, polydimethylsiloxane polyether copolymers with pendant quaternary ammonium sidechains; and also further modifications of the preceding copolymers containing pendant C2-C30 straight, branched, or cyclic alkyl moieties. Examples of commercially available dimethicone copolyols useful herein sold by Dow Corning Corporation are Dow Corning® 190, 193, Q2-5220, 2501 Wax, 2-5324 fluid, and 3225C (this later material being sold as a mixture with cyclomethicone). Cetyl dimethicone copolyol is commercially available as a mixture with polyglyceryl-4 isostearate (and) hexyl laurate and is sold under the tradename ABIL® WE-09 (available from Goldschmidt). Cetyl dimethicone copolyol is also commercially available as a mixture with hexyl laurate (and) polyglyceryl-3 oleate (and) cetyl dimethicone and is sold under the tradename ABIL® WS-08 (also available from Goldschmidt). Other nonlimiting examples of dimethicone copolyols also include lauryl dimethicone copolyol, dimethicone copolyol acetate, dimethicone copolyol adipate, dimethicone copolyolamine, dimethicone copolyol behenate, dimethicone copolyol butyl ether, dimethicone copolyol hydroxy stearate, dimethicone copolyol isostearate, dimethicone copolyol laurate, dimethicone copolyol methyl ether, dimethicone copolyol phosphate, and dimethicone copolyol stearate. See International Cosmetic Ingredient Dictionary, Fifth Edition, 1993.

Dimethicone copolyol emulsifiers useful herein are described, for example, in U.S. Patent No. 4,960,764, to Figueroa, Jr. et al., issued October 2, 1990; European Patent No. EP 330,369, to

SanoGueira, published August 30, 1989; G.H. Dahms, et al., "New Formulation Possibilities Offered by Silicone Copolyols," Cosmetics & Toiletries, vol. 110, pp. 91-100, March 1995; M.E. Carlotti et al., "Optimization of W/O-S Emulsions And Study Of The Quantitative Relationships Between Ester Structure And Emulsion Properties," J. Dispersion Science And Technology, 13(3), 315-336 (1992); P. Hameyer, "Comparative Technological Investigations of Organic and Organosilicone Emulsifiers in Cosmetic Water-in-Oil Emulsion Preparations," HAPPI 28(4), pp. 88-128 (1991); J. Smid-Korbar et al., "Efficiency and usability of silicone surfactants in emulsions," Provisional Communication, International Journal of Cosmetic Science, 12, 135-139 (1990); and D.G. Krzysik et al., "A New Silicone Emulsifier For Water-in-Oil Systems," Drug and Cosmetic Industry, vol. 146(4) pp. 28-81 (April 1990).

Other suitable emulsifiers are described, for example, in McCutcheon's, Detergents and Emulsifiers, North American Edition (1986), published by Allured Publishing Corporation.

B) Oil-in-Water Emulsions

Other preferred topical carrier forms include oil-in-water emulsions, having a continuous aqueous phase and a hydrophobic, water-insoluble phase ("oil phase") dispersed therein. Examples of suitable oil-in-water emulsion carriers are described in U.S. Pat. No. 5,073,371, to Turner, D.J. et al., issued Dec. 17, 1991, and U.S. Pat. No. 5,073,372, to Turner, D.J. et al., issued Dec. 17, 1991.

Surfactant

The oil-in-water emulsion forms of the present invention may, in some embodiments, contain from about 0.05% to about 10%, preferably from about 1% to about 6%, and more preferably from about 1% to about 3% of a surfactant which can disperse the hydrophobic materials in the water phase (percentages by weight of the topical carrier).

Surfactants useful herein include nonionic, cationic, anionic, zwitterionic, and amphoteric surfactants such as are known in the art. See, e.g., McCutcheon's, Detergents and Emulsifiers, North American Edition (1986), published by Allured Publishing Corporation and incorporated herein by reference. The surfactants useful herein can contain a single surfactant, or any combination of suitable surfactants.

Water

The preferred oil-in-water emulsion contains from about 0.1% to about 99%, preferably from about 1% to about 80%, more preferably from about 2% to about 50% water by weight of the composition.

Product Forms

The topical compositions of the subject invention, including but not limited to lotions and creams, may contain a dermatologically acceptable emollient. Such compositions preferably contain from about 1% to about 50% of the emollient. As used herein, "emollient" refers to a material useful for the prevention or relief of dryness, as well as for the protection of the skin. A wide variety of suitable emollients are known and may be used herein. Sagarin, Cosmetics, Science and Technology, 2nd Edition, Vol. 1, pp. 32-43 (1972), incorporated herein by reference, contains numerous examples of materials suitable as an emollient. A preferred emollient is glycerin. Glycerin is preferably used in an amount of from or about 0.001 to or about 30%, more preferably from or about 0.01 to or about 20%, still more preferably from or about 0.1 to or about 10%.

Ointments of the present invention may contain a simple carrier base of animal or vegetable oils or semi-solid hydrocarbons (oleaginous); absorption ointment bases which absorb water to form emulsions; or water soluble carriers, e.g., a water soluble solution carrier. Ointments may further contain a thickening agent, such as described in Sagarin, Cosmetics, Science and Technology, 2nd Edition, Vol. 1, pp. 72-73 (1972), incorporated herein by reference, and/or an emollient. For example, an ointment may contain from about 2% to about 10% of an emollient; from about 0.1% to about 2% of a thickening agent; and the other ingredients in the above described amounts.

The compositions of the present invention, in some embodiments, may be formulated as a cosmetic foundation. As used herein, the term "foundation" refers to a liquid, semi-liquid, semi-solid, or solid skin cosmetic which includes, but is not limited to lotions, creams, gels, pastes, cakes, and the like. Typically the foundation can either be used over a large area of the skin, such as over the face, or may be applied to specific areas to hide skin imperfections and impart a smooth, even appearance to the skin. Foundations of the present invention may include conventional ingredients such as oils, colorants, pigments, emollients, fragrances, stabilizers, and the like.

Stress Creation Material

The compositions of the present invention, in some embodiments, may further contain an additional physical stress creating material (in addition to the oil-soluble film-forming polymer discussed above) that is useful for providing additional physical stress to the skin in order to further regulate the appearance of skin wrinkles. Preferred for use herein are inorganic film-forming colloids and ionic film-forming polymers, discussed below.

A) Inorganic Colloids

The compositions of the present invention may, in some embodiments, further include from about 0.1% to about 60%, by weight of the composition, of an inorganic colloid. Preferably, the inorganic colloid is a film-forming inorganic colloid having a Tg of greater than 25°C.

By "film-forming" as used herein is meant that the dispersed inorganic colloid is capable of forming a film when spread onto glass and allowed to dry at ambient temperature. Preferably, the inorganic colloid is capable of forming a continuous film when dried on the glass.

Preferred inorganic film-forming colloid useful herein include silica, boehmite alumina, zirconium dioxide, zirconium polyanions, boron nitride, nickel hydroxide, nickel acetate, zinc hydroxide, titanium dioxide and mixtures thereof. An even more preferred inorganic film-forming colloid for use herein is silica.

Preferably, the inorganic colloid is in the form of a sol. By "sol," as used herein is meant a dispersion of the inorganic colloid material in a polar solvent. In general, "polar solvent" refers to those solvents that contain hydroxyl and/or carbonyl groups and also have high dielectric constants and strong polarity.

Preferably, the inorganic colloid is negatively charged and has a particle size of less than 50 nm and a surface area of greater than 100 m^2/g. Preferably the inorganic colloid has a Tg of from 25°C to about 1200°C, more preferably from about 50°C to about 900°C.

Examples of inorganic colloids useful herein include metal compounds (e.g. zinc, titanium, silicon, aluminum) with aquo ligands (OH_2-) or hydroxy ligands (OH) or oxo ligands (=O). Examples of such compounds include colloidal silica such as SiO_2, commercially available as NALCO 1034A silica, NALCO 1115 silica, LUDOX, and SNOWTEX, from Nalco Chemical. Examples also include colloidal beohmite/alumina such as Al_2O_3 commerically available as ALUMINA SOL 520. Examples also include colloidal zirconium dioxide sol ZrO_2 or polyanions like $Zr(HPO_4)_2$. Examples further include colloidal sol of boron nitride; colloidal nickel hydroxide or $Ni(OAc)_2$ sols.

B) Ionic Film-Forming Polymers

The topical compositions of the present invention may, in some embodiments, further include from about 0.1% to about 70%, preferably from about 1% to about 50%, more preferably from about 3% to about 40%, even more preferably from about 5% to about 25%, by weight of the composition, of an ionic, film-forming polymer having a Tg of greater than 25°C.

Preferably, the ionic film-forming polymers have a negative charge density of at least one negative charge per every ten repeating units of polymer, more preferably one negative charge per every two repeating units of polymer, even more preferably one negative charge per repeating

unit of polymer. Preferred are ionic film-forming polymers having a Tg of from 25°C to about 300°C, more preferably from about 50°C to about 200°C.

Examples of ionic film-forming polymers useful herein include the anionic film-forming polymers sodium polystyrene sulfonate, sodium silicone t-butyl acrylate, sodium poly(styrene sulfonate/maleic anhydride), sodium poly(styrene sulfonate co acrylein), polyvinylsulfonate, polyvinyl sulfate, polyphosphate, polymethacrylate, sodium dextran sulphate, poly(ethylene oxide co styrene sulfonate), and mixtures thereof. Also useful herein are the hydrophobically modified derivatives and polyampholytes of sodium polystyrene sulfonate, sodium silicone t-butyl acrylate, sodium poly(styrene sulfonate/maleic anhydride), sodium poly(styrene sulfonate co acrylein), polyvinylsulfonate, polyvinyl sulfate, polyphosphate, polymethacrylate, sodium dextran sulphate, poly(ethylene oxide co styrene sulfonate), and mixtures thereof.. A preferred anionic, film-forming polymer for use herein is sodium polystyrene sulfonate.

By "hydrophobically modified" is meant that hydrophobic regions are attached off the main chain of the polymer in order to make the polymer net more hydrophobic. Such modification is within the skill of one in the art.

By "polyampholytes" is meant that the polymer contains both ionic groups off the main chain as well as surfactant-like groups off the main chain. An example of polyampholytes useful herein includes poly(acrylamide-co-styrene sulfonate).

Other examples of ionic film-forming polymers useful herein include cationic film-forming polymers having a charge density of at least one negative charge per every repeating units, more preferably at least one negative charge per repeating unit. Preferred are those cationic film-forming polymers having a water insoluble backbone. A preferred cationic film-forming polymer for use herein is chitosan lactate.

Commercially available ionic film-forming polymers useful herein include the FLEXAN and VERSAFLEX series of sodium polystyrene sulfonates available from National Starch.

Optional Skin Care Actives

The compositions of the present invention may, in some embodiments, contain one or more additional skin care actives.

In a preferred embodiment, where the composition is to be in contact with human keratinous tissue, the additional components should be suitable for application to keratinous tissue, that is, when incorporated into the composition they are suitable for use in contact with human keratinous tissue without undue toxicity, incompatibility, instability, allergic response, and the like within the scope of sound medical judgment. The *CTFA Cosmetic Ingredient Handbook*,

Second Edition (1992) describes a wide variety of nonlimiting cosmetic and pharmaceutical ingredients commonly used in the skin care industry, which are suitable for use in the compositions of the present invention. Examples of these ingredient classes include: abrasives, absorbents, aesthetic components such as fragrances, pigments, colorings/colorants, essential oils, skin sensates, astringents, etc. (e.g., clove oil, menthol, camphor, eucalyptus oil, eugenol, menthyl lactate, witch hazel distillate), anti-acne agents, anti-caking agents, antifoaming agents, antimicrobial agents (e.g., iodopropyl butylcarbamate), antioxidants, binders, biological additives, buffering agents, bulking agents, chemical additives, colorants, cosmetic astringents, cosmetic biocides, denaturants, drug astringents, external analgesics, opacifying agents, pH adjusters, propellants, reducing agents, sequestrants, skin bleaching and lightening agents (e.g., hydroquinone and ascorbyl glucosamine), skin-conditioning agents (e.g., humectants, including miscellaneous and occlusive), skin soothing and/or healing agents (e.g., panthenol and derivatives thereof including, e.g. ethyl panthenol), aloe vera, pantothenic acid and its derivatives, allantoin, bisabolol, and dipotassium glycyrrhizinate), skin treating agents, thickeners, and vitamins and derivatives thereof.

In any embodiment of the present invention, however, the actives useful herein can be categorized by the benefit they provide or by their postulated mode of action. However, it is to be understood that the actives useful herein can in some instances provide more than one benefit or operate via more than one mode of action. Therefore, classifications herein are made for the sake of convenience and are not intended to limit the active to that particular application or applications listed.

Phytantriol

The topical compositions of the present invention may, in some embodiments, contain a safe and effective amount of phytantriol. Phytantriol is the common name for the chemical known as 3,7,11,15,tetramethylhexadecane-1,2,3,-triol. Phytantriol is commercially available from BASF (1609 Biddle Avenue, Whyandotte, MI). For example, phytantriol is useful as a spider vessel/ red blotchiness repair agent, a dark circle/puffy eye repair agent, sallowness repair agent, a sagging repair agent, an anti-itch agent, a skin thickening agent, a pore reduction agent, oil/shine reduction agent, a post-inflammatory hyperpigmentation repair agent, wound treating agent, an anti-cellulite agent, and for regulating skin texture, including wrinkles and fine lines.

When included in compositions of the present invention, the phytantriol preferably is included in an amount from about 0.001% to about 50% by weight of the composition, more preferably from about 0.01% to about 20%, even more preferably from about 0.1% to about 15%, even more preferably from about 0.2% to about 10%.

Farnesol

The topical compositions of the present invention may, in some embodiments, contain a safe and effective amount of farnesol. Farnesol is a naturally occurring substance which is believed to act as a precursor and/or intermediate in the biosynthesis of squalene and sterols, especially cholesterol. Farnesol is also involved in protein modification and regulation (e.g., farnesylation of proteins), and there is a cell nuclear receptor which is responsive to farnesol.

Chemically, farnesol is [2E,6E]-3,7,11-trimethyl-2,6,10-dodecatrien-1-ol and as used herein "farnesol" includes isomers and tautomers of such. Farnesol is commercially available, e.g., under the names farnesol (a mixture of isomers from Dragoco, 10 Gordon Drive, Totowa, New Jersey) and trans-trans-farnesol (Sigma Chemical Company, P. O. Box 14508, St. Louis, Missouri).

When present in the compositions of the present invention, the composition preferably contains from about 0.001% to about 50%, by weight of the composition, more preferably from about 0.01% to about 20%, even more preferably from about 0.1% to about 15%, even more preferably from about 0.1% to about 10% of farnesol.

Anti-Wrinkle Actives/Anti-Atrophy Actives

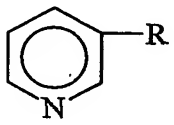
The compositions of the present invention may further contain a safe and effective amount of one or more anti-wrinkle actives or anti-atrophy actives. Exemplary anti-wrinkle/anti-atrophy actives suitable for use in the compositions of the present invention include sulfur-containing D and L amino acids and their derivatives and salts, particularly the N-acetyl derivatives, a preferred example of which is N-acetyl-L-cysteine; thiols, e.g. ethane thiol; hydroxy acids (e.g., alpha-hydroxy acids such as lactic acid and glycolic acid or beta-hydroxy acids such as salicylic acid and salicylic acid derivatives such as the octanoyl derivative), phytic acid, lipoic acid; lysophosphatidic acid, skin peel agents (e.g., phenol and the like), vitamin B_3 compounds and retinoids which enhance the keratinous tissue appearance benefits of the present invention, especially in regulating keratinous tissue condition, e.g., skin condition.

a) Vitamin B_3 Compounds

The compositions of the present invention may contain a safe and effective amount of a vitamin B_3 compound. Vitamin B_3 compounds are particularly useful for regulating skin condition as described in U. S. Patent No. 5,939,082 issued August 17, 1999, and incorporated herein by reference. When vitamin B_3 compounds are present in the compositions of the instant invention, the compositions preferably contain from about 0.01% to about 50%, more preferably from about 0.1% to about 10%, even more preferably from about 0.5% to about 10%, and still

more preferably from about 1% to about 5%, by weight of the composition, of the vitamin B_3 compound.

As used herein, "vitamin B_3 compound" means a compound having the formula:



wherein R is - $CONH_2$ (i.e., niacinamide), - COOH (i.e., nicotinic acid) or - CH_2OH (i.e., nicotinyl alcohol); derivatives thereof; and salts of any of the foregoing.

Exemplary derivatives of the foregoing vitamin B_3 compounds include nicotinic acid esters, including non-vasodilating esters of nicotinic acid (e.g., tocopheryl nicotinate), nicotinyl amino acids, nicotinyl alcohol esters of carboxylic acids, nicotinic acid N-oxide and niacinamide N-oxide.

Examples of suitable vitamin B_3 compounds are well known in the art and are commercially available from a number of sources, e.g., the Sigma Chemical Company (St. Louis, MO); ICN Biomedicals, Inc. (Irvin, CA) and Aldrich Chemical Company (Milwaukee, WI).

The vitamin compounds may be included as the substantially pure material, or as an extract obtained by suitable physical and/or chemical isolation from natural (e.g., plant) sources.

b) Retinoids

The compositions of the present invention may also contain a retinoid. As used herein, "retinoid" includes all natural and/or synthetic analogs of Vitamin A or retinol-like compounds which possess the biological activity of Vitamin A in the skin as well as the geometric isomers and stereoisomers of these compounds. The retinoid is preferably retinol, retinol esters (e.g., C_2 - C_{22} alkyl esters of retinol, including retinyl palmitate, retinyl acetate, retinyl propionate), retinal, and/or retinoic acid (including all-trans retinoic acid and/or 13-cis-retinoic acid), more preferably retinoids other than retinoic acid. These compounds are well known in the art and are commercially available from a number of sources, e.g., Sigma Chemical Company (St. Louis, MO), and Boerhinger Mannheim (Indianapolis, IN). Other retinoids which are useful herein are described in U.S. Patent Nos. 4,677,120, issued Jun. 30, 1987 to Parish et al.; 4,885,311, issued Dec. 5, 1989 to Parish et al.; 5,049,584, issued Sep. 17, 1991 to Purcell et al.; 5,124,356, issued Jun. 23, 1992 to Purcell et al.; and Reissue 34,075, issued Sep. 22, 1992 to Purcell et al.. Other suitable retinoids are tocopheryl-retinoate [tocopherol ester of retinoic acid (trans- or cis-), adapalene {6-[3-(1-adamantyl)-4-methoxyphenyl]-2-naphthoic acid}, and tazarotene (ethyl 6-[2-

(4,4-dimethylthiochroman-6-yl)-ethynyl]nicotinate). Preferred retinoids are retinol, retinyl palmitate, retinyl acetate, retinyl propionate, retinal and combinations thereof.

The retinoid may be included as the substantially pure material, or as an extract obtained by suitable physical and/or chemical isolation from natural (e.g., plant) sources. The retinoid is preferably substantially pure, more preferably essentially pure.

The compositions of this invention may contain a safe and effective amount of the retinoid, such that the resultant composition is safe and effective for regulating keratinous tissue condition, preferably for regulating visible and/or tactile discontinuities in skin, more preferably for regulating signs of skin aging, even more preferably for regulating visible and/or tactile discontinuities in skin texture associated with skin aging. The compositions preferably contain from or about 0.005% to or about 2%, more preferably 0.01% to or about 2%, retinoid. Retinol is preferably used in an amount of from or about 0.01% to or about 0.15%; retinol esters are preferably used in an amount of from or about 0.01% to or about 2% (e.g., about 1%); retinoic acids are preferably used in an amount of from or about 0.01% to or about 0.25%; tocopheryl-retinoate, adapalene, and tazarotene are preferably used in an amount of from or about 0.01% to or about 2%.

Where the compositions of the present invention contain both a retinoid and a Vitamin B_3 compound, the retinoid is preferably used in the above amounts, and the vitamin B_3 compound is preferably used in an amount of from or about 0.1% to or about 10%, more preferably from or about 2% to or about 5%.

Peptides

Peptides, including but not limited to, di-, tri-, tetra-, and pentapeptides and derivatives thereof, may be included in the compositions of the present invention in amounts that are safe and effective. As used herein, "peptides" refers to both the naturally occurring peptides and synthesized peptides. Also useful herein are naturally occurring and commercially available compositions that contain peptides.

Suitable dipeptides for use herein include Carnosine® (beta-ala-his). Suitable tripeptides for use herein include, gly-his-lys, arg-lys-arg, his-gly-gly. Preferred tripeptides and derivatives thereof include palmitoyl-gly-his-lys, which may be purchased as Biopeptide CL® (100ppm of palmitoyl-gly-his-lys commerically available from Sederma, France); Peptide CK (arg-lys-arg); PEPTIDE CK+ (ac-arg-lys-arg-NH_2); and a copper derivative of his-gly-gly sold commercially as IAMIN, from Sigma (St.Louis, Missouri). Tetrapeptides and pentapeptides are also suitable for

use herein. A preferred commercially available pentapeptide derivative composition is MATRIXYL®, (commercially available from Sederma France).

When included in the present compositions, peptides are preferably included in amounts of from about $1x10^{-6}$% to about 10%, more preferably from about $1x10^{-6}$% to about 0.1%, even more preferably from about $1x10^{-5}$% to about 0.01%, by weight of the composition. In certain compositions where the peptide is Carnosine®, the compositions preferably contain from about 0.1% to about 5%, by weight of the composition, of such peptides. In other embodiments wherein the peptide-containing compositions, Matrixyl®, and/or Biopeptide CL® are included, the compositions preferably contain from about 0.1% to about 10%, by weight compositions, of Matrixyl® and/or Biopeptide CL® peptide-containing compositions.

Anti-Oxidants/Radical Scavengers

The compositions of the present invention may include a safe and effective amount of an anti-oxidant/radical scavenger. The anti-oxidant/radical scavenger is especially useful for providing protection against UV radiation which can cause increased scaling or texture changes in the stratum corneum and against other environmental agents which can cause skin damage.

A safe and effective amount of an anti-oxidant/radical scavenger may be added to the compositions of the subject invention, preferably from about 0.1% to about 10%, more preferably from about 1% to about 5%, of the composition.

Anti-oxidants/radical scavengers such as ascorbyl esters of fatty acids, tocopherol (vitamin E), tocopherol sorbate, tocopherol acetate, other esters of tocopherol, amines (e.g., N,N-diethylhydroxylamine, amino-guanidine), sulfhydryl compounds (e.g., glutathione), lycine pidolate, arginine pilolate, nordihydroguaiaretic acid, bioflavonoids, curcumin, lysine, methionine, proline, superoxide dismutase, silymarin, tea extracts, grape skin/seed extracts, melanin, and rosemary extracts may be used. Preferred anti-oxidants/radical scavengers are selected from tocopherol sorbate and other esters of tocopherol, more preferably tocopherol sorbate. For example, the use of tocopherol sorbate in topical compositions and applicable to the present invention is described in U.S. Patent No. 4,847,071, issued on July 11, 1989 to Donald L. Bissett, Rodney D. Bush and Ranjit Chatterjee.

Flavonoids

The compositions of the present invention may optionally contain a flavonoid compound. Flavonoids are broadly disclosed in U.S. Patents 5,686,082 and 5,686,367, both of which are herein incorporated by reference. Flavonoids suitable for use in the present invention are flavanones selected from unsubstituted flavanones, mono-substituted flavanones, and mixtures thereof; chalcones selected from unsubstituted chalcones, mono-substituted chalcones, di-

substituted chalcones, tri-substituted chalcones, and mixtures thereof; flavones selected from unsubstituted flavones, mono-substituted flavones, di-substituted flavones, and mixtures thereof; one or more isoflavones; coumarins selected from unsubstituted coumarins, mono-substituted coumarins, di-substituted coumarins, and mixtures thereof; chromones selected from unsubstituted chromones, mono-substituted chromones, di-substituted chromones, and mixtures thereof; one or more dicoumarols; one or more chromanones; one or more chromanols; isomers (e.g., cis/trans isomers) thereof; and mixtures thereof. By the term "substituted" as used herein means flavonoids wherein one or more hydrogen atom of the flavonoid has been independently replaced with hydroxyl, C1-C8 alkyl, C1-C4 alkoxyl, O-glycoside, and the like or a mixture of these substituents.

Examples of suitable flavonoids include, but are not limited to, unsubstituted flavanone, mono-hydroxy flavanones (e.g., 2'-hydroxy flavanone, 6-hydroxy flavanone, 7-hydroxy flavanone, etc.), mono-alkoxy flavanones (e.g., 5-methoxy flavanone, 6-methoxy flavanone, 7-methoxy flavanone, 4'-methoxy flavanone, etc.), unsubstituted chalcone (especially unsubstituted trans-chalcone), mono-hydroxy chalcones (e.g., 2'-hydroxy chalcone, 4'-hydroxy chalcone, etc.), di-hydroxy chalcones (e.g., 2',4-dihydroxy chalcone, 2',4'-dihydroxy chalcone, 2,2'-dihydroxy chalcone, 2',3-dihydroxy chalcone, 2',5'-dihydroxy chalcone, etc.), and tri-hydroxy chalcones (e.g., 2',3',4'-trihydroxy chalcone, 4,2',4'-trihydroxy chalcone, 2,2',4'-trihydroxy chalcone, etc.), unsubstituted flavone, 7,2'-dihydroxy flavone, 3',4'-dihydroxy naphthoflavone, 4'-hydroxy flavone, 5,6-benzoflavone, and 7,8-benzoflavone, unsubstituted isoflavone, daidzein (7,4'-dihydroxy isoflavone), 5,7-dihydroxy-4'-methoxy isoflavone, soy isoflavones (a mixture extracted from soy), unsubstituted coumarin, 4-hydroxy coumarin, 7-hydroxy coumarin, 6-hydroxy-4-methyl coumarin, unsubstituted chromone, 3-formyl chromone, 3-formyl-6-isopropyl chromone, unsubstituted dicoumarol, unsubstituted chromanone, unsubstituted chromanol, and mixtures thereof..

They can be synthetic materials or obtained as extracts from natural sources (e.g., plants). The naturally sourced material can also further be derivatized (e.g., an ester or ether derivative prepared following extraction from a natural source). Flavonoid compounds useful herein are commercially available from a number of sources, e.g., Indofine Chemical Company, Inc. (Somerville, New Jersey), Steraloids, Inc. (Wilton, New Hampshire), and Aldrich Chemical Company, Inc. (Milwaukee, Wisconsin).

Mixtures of the above flavonoid compounds may also be used.

The herein described flavonoid compounds are preferably present in the instant invention at concentrations of from about 0.01% to about 20%, more preferably from about 0.1% to about 10%, and still more preferably from about 0.5% to about 5%.

Anti-Inflammatory Agents

A safe and effective amount of an anti-inflammatory agent may be added to the compositions of the present invention, preferably from about 0.1% to about 10%, more preferably from about 0.5% to about 5%, of the composition. The anti-inflammatory agent enhances the skin appearance benefits of the present invention, e.g., such agents contribute to a more uniform and acceptable skin tone or color. The exact amount of anti-inflammatory agent to be used in the compositions will depend on the particular anti-inflammatory agent utilized since such agents vary widely in potency.

Steroidal anti-inflammatory agents, including but not limited to, corticosteroids such as hydrocortisone, hydroxyltriamcinolone, alpha-methyl dexamethasone, dexamethasone-phosphate, beclomethasone dipropionates, clobetasol valerate, desonide, desoxymethasone, desoxycorticosterone acetate, dexamethasone, dichlorisone, diflorasone diacetate, diflucortolone valerate, fluadrenolone, fluclorolone acetonide, fludrocortisone, flumethasone pivalate, fluosinolone acetonide, fluocinonide, flucortine butylesters, fluocortolone, fluprednidene (fluprednylidene) acetate, flurandrenolone, halcinonide, hydrocortisone acetate, hydrocortisone butyrate, methylprednisolone, triamcinolone acetonide, cortisone, cortodoxone, flucetonide, fludrocortisone, difluorosone diacetate, fluradrenolone, fludrocortisone, diflurosone diacetate, fluradrenolone acetonide, medrysone, amcinafel, amcinafide, betamethasone and the balance of its esters, chloroprednisone, chlorprednisone acetate, clocortelone, clescinolone, dichlorisone, diflurprednate, flucloronide, flunisolide, fluoromethalone, fluperolone, fluprednisolone, hydrocortisone valerate, hydrocortisone cyclopentylpropionate, hydrocortamate, meprednisone, paramethasone, prednisolone, prednisone, beclomethasone dipropionate, triamcinolone, and mixtures thereof may be used. The preferred steroidal anti-inflammatory for use is hydrocortisone.

A second class of anti-inflammatory agents which is useful in the compositions includes the nonsteroidal anti-inflammatory agents. The variety of compounds encompassed by this group are well-known to those skilled in the art. For detailed disclosure of the chemical structure, synthesis, side effects, etc. of non-steroidal anti-inflammatory agents, one may refer to standard texts, including Anti-inflammatory and Anti-Rheumatic Drugs, K. D. Rainsford, Vol. I-III, CRC Press, Boca Raton, (1985), and Anti-inflammatory Agents, Chemistry and Pharmacology, 1, R. A. Scherrer, et al., Academic Press, New York (1974).

Specific non-steroidal anti-inflammatory agents useful in the composition invention include, but are not limited to:

1) the oxicams, such as piroxicam, isoxicam, tenoxicam, sudoxicam, and CP-14,304;

2) the salicylates, such as aspirin, disalcid, benorylate, trilisate, safapryn, solprin, diflunisal, and fendosal;

3) the acetic acid derivatives, such as diclofenac, fenclofenac, indomethacin, sulindac, tolmetin, isoxepac, furofenac, tiopinac, zidometacin, acematacin, fentiazac, zomepirac, clindanac, oxepinac, felbinac, and ketorolac;

4) the fenamates, such as mefenamic, meclofenamic, flufenamic, niflumic, and tolfenamic acids;

5) the propionic acid derivatives, such as ibuprofen, naproxen, benoxaprofen, flurbiprofen, ketoprofen, fenoprofen, fenbufen, indopropfen, pirprofen, carprofen, oxaprozin, pranoprofen, miroprofen, tioxaprofen, suprofen, alminoprofen, and tiaprofenic; and

6) the pyrazoles, such as phenylbutazone, oxyphenbutazone, feprazone, azapropazone, and trimethazone.

Mixtures of these non-steroidal anti-inflammatory agents may also be employed, as well as the dermatologically acceptable esters of these agents. For example, etofenamate, a flufenamic acid derivative, is particularly useful for topical application. Of the nonsteroidal anti-inflammatory agents, ibuprofen, naproxen, flufenamic acid, etofenamate, aspirin, mefenamic acid, meclofenamic acid, piroxicam and felbinac are preferred; ibuprofen, naproxen, ketoprofen, etofenamate, aspirin and flufenamic acid are more preferred.

Additionally, so-called "natural" anti-inflammatory agents are useful in methods of the present invention. Such agents may suitably be obtained as an extract by suitable physical and/or chemical isolation from natural sources (e.g., plants, fungi, by-products of microorganisms) or can be synthetically prepared. For example, candelilla wax, bisabolol (e.g., alpha bisabolol), aloe vera, plant sterols (e.g., phytosterol), Manjistha (extracted from plants in the genus Rubia, particularly Rubia Cordifolia), and Guggal (extracted from plants in the genus Commiphora, particularly Commiphora Mukul), kola extract, chamomile, red clover extract, and sea whip extract, may be used.

Additional anti-inflammatory agents useful herein include compounds of the Licorice (the plant genus/species Glycyrrhiza glabra) family, including glycyrrhetic acid, glycyrrhizic acid, and derivatives thereof (e.g. esters). Suitable esters include C_2 - C_{24} saturated or unsaturated esters

of the acids, preferably C_{10} - C_{24}, more preferably C_{16} - C_{24}. Specific examples of the foregoing include oil soluble licorice extract, the glycyrrhizic and glycyrrhetic acids themselves.

Anti-Cellulite Agents

The compositions of the present invention may also contain a safe and effective amount of an anti-cellulite agent. Suitable agents may include, but are not limited to, xanthine compounds (e.g., caffeine, theophylline, theobromine, and aminophylline).

Topical Anesthetics

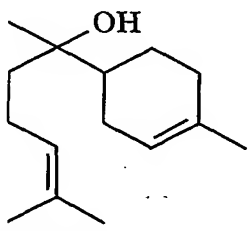
The compositions of the present invention may also contain a safe and effective amount of a topical anesthetic. Examples of topical anesthetic drugs include benzocaine, lidocaine, bupivacaine, chlorprocaine, dibucaine, etidoçaine, mepivacaine, tetracaine, dyclonine, hexylcaine, procaine, cocaine, ketamine, pramoxine, phenol, and pharmaceutically acceptable salts thereof.

Skin Soothing and Skin Healing Actives

The compositions of the present invention may comprise a skin soothing or skin healing active. Skin soothing or skin healing actives suitable for use herein include panthenoic acid derivatives (including panthenol, dexpanthenol, ethyl panthenol), aloe vera, allantoin, bisabolol, and dipotassium glycyrrhizinate. A safe and effective amount of a skin soothing or skin healing active may be added to the present composition, preferably, from about 0.1% to about 30%, more preferably from about 0.5% to about 20%, still more preferably from about 0.5% to about 10 %, by weight of the composition formed.

a) bisabolol

The topical compositions of the present invention may also contain a safe and effective amount of bisabolol. Bisabolol is a naturally occurring unsaturated monocyclic terpene alcohol having the following structure



It is the primary active component of chamomile extract/oil. Bisabolol can be synthetic (d,l - alpha-isomer or (+/-)-alpha-isomer) or natural ((-)-alpha-isomer) in origin and can be used as essentially pure compounds or mixtures of compounds (e.g., extracts from natural sources such as chamomile). The alpha form of bisabolol (á-bisabolol) is used in a variety of cosmetic products as a skin conditioning or soothing agent. As used herein, "bisabolol" includes chamomile extract

or oil and any isomers and tautomers of such. Suitable bisabolol compounds are commercially available as a natural material from Dragoco (Totowa, New Jersey) under the product name alpha-bisabolol natural and as a synthetic material from Fluka (Milwaukee, Wisconsin) under the product name alpha-bisabolol.

In the compositions of the present invention, the composition preferably contains from about 0.001% to about 50%, by weight of the composition, more preferably from about 0.01% to about 20%, of bisabolol, even more preferably from about 0.1% to about 5%.

Antimicrobial and Antifungal Actives

The compositions of the present invention may contain an antimicrobial or antifungal active. Such actives are capable of destroying microbes, preventing the development of microbes or preventing the pathogenic action of microbes. A safe and effective amount of an antimicrobial or antifungal active may be added to the present compositions, preferably, from about 0.001% to about 10%, more preferably from about 0.01% to about 5%, and still more preferably from about 0.05% to about 2%.

Preferred examples of actives useful herein include those selected from salicylic acid, benzoyl peroxide, 3-hydroxy benzoic acid, glycolic acid, lactic acid, 4-hydroxy benzoic acid, acetyl salicylic acid, 2-hydroxybutanoic acid, 2-hydroxypentanoic acid, 2-hydroxyhexanoic acid, cis-retinoic acid, trans-retinoic acid, retinol, phytic acid, N-acetyl-L-cysteine, lipoic acid, azelaic acid, arachidonic acid, benzoylperoxide, tetracycline, ibuprofen, naproxen, hydrocortisone, acetominophen, resorcinol, phenoxyethanol, phenoxypropanol, phenoxyisopropanol, 2,4,4'-trichloro-2'-hydroxy diphenyl ether, 3,4,4'-trichlorocarbanilide, octopirox, lidocaine hydrochloride, clotrimazole, miconazole, ketoconazole, neocycin sulfate, and mixtures thereof.

Sunscreen Actives

Exposure to ultraviolet light can result in excessive scaling and texture changes of the stratum corneum. Therefore, the compositions of the subject invention may optionally contain a sunscreen active. As used herein, "sunscreen active" includes both sunscreen agents and physical sunblocks. Suitable sunscreen actives may be organic or inorganic.

Inorganic sunscreens useful herein include the following metallic oxides; titanium dioxide having an average primary particle size of from about 15 nm to about 100 nm, zinc oxide having an average primary particle size of from about 15 nm to about 150 nm, zirconium oxide having an average primary particle size of from about 15 nm to about 150 nm, iron oxide having an average primary particle size of from about 15 nm to about 500nm, and mixtures thereof. When used herein, the inorganic sunscreens are present in the amount of from about 0.1% to about 20%,

preferably from about 0.5% to about 10%, more preferably from about 1% to about 5%, by weight of the composition.

A wide variety of conventional organic sunscreen actives are suitable for use herein. Sagarin, et al., at Chapter VIII, pages 189 et seq., of Cosmetics Science and Technology (1972), discloses numerous suitable actives. Specific suitable sunscreen actives include, for example: p-aminobenzoic acid, its salts and its derivatives (ethyl, isobutyl, glyceryl esters; p-dimethylaminobenzoic acid); anthranilates (i.e., o-amino-benzoates; methyl, menthyl, phenyl, benzyl, phenylethyl, linalyl, terpinyl, and cyclohexenyl esters); salicylates (amyl, phenyl, octyl, benzyl, menthyl, glyceryl, and di-pro-pyleneglycol esters); cinnamic acid derivatives (menthyl and benzyl esters, a-phenyl cinnamonitrile; butyl cinnamoyl pyruvate); dihydroxycinnamic acid derivatives (umbelliferone, methylumbelliferone, methylaceto-umbelliferone); trihydroxy-cinnamic acid derivatives (esculetin, methylesculetin, daphnetin, and the glucosides, esculin and daphnin); hydrocarbons (diphenylbutadiene, stilbene); dibenzalacetone and benzalacetophenone; naphtholsulfonates (sodium salts of 2-naphthol-3,6-disulfonic and of 2-naphthol-6,8-disulfonic acids); di-hydroxynaphthoic acid and its salts; o- and p-hydroxybiphenyldisulfonates; coumarin derivatives (7-hydroxy, 7-methyl, 3-phenyl); diazoles (2-acetyl-3-bromoindazole, phenyl benzoxazole, methyl naphthoxazole, various aryl benzothiazoles); quinine salts (bisulfate, sulfate, chloride, oleate, and tannate); quinoline derivatives (8-hydroxyquinoline salts, 2-phenylquinoline); hydroxy- or methoxy-substituted benzophenones; uric and violuric acids; tannic acid and its derivatives (e.g., hexaethylether); (butyl carbotol) (6-propyl piperonyl) ether; hydroquinone; benzophenones (oxybenzene, sulisobenzone, dioxybenzone, benzoresorcinol, 2,2',4,4'-tetrahydroxybenzophenone, 2,2'-dihydroxy-4,4'-dimethoxybenzophenone, octabenzone; 4-isopropyldibenzoylmethane; butylmethoxydibenzoylmethane; etocrylene; octocrylene; [3-(4'-methylbenzylidene bornan-2-one), terephthalylidene dicamphor sulfonic acid and 4-isopropyl-di-benzoylmethane.

Of these, 2-ethylhexyl-p-methoxycinnamate (commercially available as PARSOL MCX), 4,4'-t-butyl methoxydibenzoyl-methane (commercially available as PARSOL 1789), 2-hydroxy-4-methoxybenzophenone, octyldimethyl-p-aminobenzoic acid, digalloyltrioleate, 2,2-dihydroxy-4-methoxybenzophenone, ethyl-4-(bis(hydroxy-propyl))aminobenzoate, 2-ethylhexyl-2-cyano-3,3-diphenylacrylate, 2-ethylhexyl-salicylate, glyceryl-p-aminobenzoate, 3,3,5-tri-methylcyclohexylsalicylate, methylanthranilate, p-dimethyl-aminobenzoic acid or aminobenzoate, 2-ethylhexyl-p-dimethyl-amino-benzoate, 2-phenylbenzimidazole-5-sulfonic acid, 2-(p-dimethylaminophenyl)-5-sulfonicbenzoxazoic acid, octocrylene and mixtures of these compounds, are preferred.

More preferred organic sunscreen actives useful in the compositions useful in the subject invention are 2-ethylhexyl-p-methoxycinnamate, butylmethoxydibenzoyl-methane, 2-hydroxy-4-methoxybenzo-phenone, 2-phenylbenzimidazole-5-sulfonic acid, octyldimethyl-p-aminobenzoic acid, octocrylene and mixtures thereof.

Also particularly useful in the compositions are sunscreen actives such as those disclosed in U.S. Patent No. 4,937,370 issued to Sabatelli on June 26, 1990, and U.S. Patent No. 4,999,186 issued to Sabatelli & Spirnak on March 12, 1991. The sunscreening agents disclosed therein have, in a single molecule, two distinct chromophore moieties which exhibit different ultra-violet radiation absorption spectra. One of the chromophore moieties absorbs predominantly in the UVB radiation range and the other absorbs strongly in the UVA radiation range.

Preferred members of this class of sunscreening agents are 4-N,N-(2-ethylhexyl)methyl-aminobenzoic acid ester of 2,4-dihydroxybenzophenone; N,N-di-(2-ethylhexyl)-4-aminobenzoic acid ester with 4-hydroxydibenzoylmethane; 4-N,N-(2-ethylhexyl)methyl-aminobenzoic acid ester with 4-hydroxydibenzoylmethane; 4-N,N-(2-ethylhexyl)methyl-aminobenzoic acid ester of 2-hydroxy-4-(2-hydroxyethoxy)benzophenone; 4-N,N-(2-ethylhexyl)-methylaminobenzoic acid ester of 4-(2-hydroxyethoxy)dibenzoylmethane; N,N-di-(2-ethylhexyl)-4-aminobenzoic acid ester of 2-hydroxy-4-(2-hydroxyethoxy)benzophenone; and N,N-di-(2-ethylhexyl)-4-aminobenzoic acid ester of 4-(2-hydroxyethoxy)dibenzoylmethane and mixtures thereof.

Especially preferred sunscreen actives include 4,4'-t-butylmethoxydibenzoylmethane, 2-ethylhexyl-p-methoxycinnamate, phenyl benzimidazole sulfonic acid, and octocrylene.

A safe and effective amount of the organic sunscreen active is used, typically from about 1% to about 20%, more typically from about 2% to about 10% by weight of the composition. Exact amounts will vary depending upon the sunscreen or sunscreens chosen and the desired Sun Protection Factor (SPF).

Hardeners/Softeners

The personal care compositions herein, in some embodiments, may include a safe and effective amount of a hardener or softener element. Examples of such hardener/softener materials include poly(t-butyl styrene), poly(t-butyl styrene co-styrene), and mixtures thereof.

Particulate Material

The compositions of the present invention may, in some embodiments, contain a particulate material, preferably a metallic oxide. These particulates can be coated or uncoated, charged or uncharged. Charged particulate materials are disclosed in U.S. Patent No. 5,997,887, to Ha, et al., incorporated herein by reference. Particulate materials useful herein include; bismuth oxychloride, iron oxide, mica, mica treated with barium sulfate and TiO2, silica, nylon,

polyethylene, talc, styrene, polypropylene, ethylene/acrylic acid copolymer, sericite, aluminum oxide, silicone resin, barium sulfate, calcium carbonate, cellulose acetate, polymethyl methacrylate, and mixtures thereof.

Conditioning Agents

The compositions of the present invention may contain a conditioning agent selected from humectants, moisturizers, or skin conditioners. A variety of these materials can be employed and each can be present at a level of from about 0.01% to about 20%, more preferably from about 0.1% to about 10. These materials include, but are not limited to, guanidine; urea; glycolic acid; salicylic acid; lactic acid (e.g., ammonium and quaternary alkyl ammonium); aloe vera in any of its variety of forms (e.g., aloe vera gel); polyhydroxy alcohols such as sorbitol, mannitol, xylitol, erythritol, glycerol, hexanetriol, butanetriol, propylene glycol, butylene glycol, hexylene glycol and the like; polyethylene glycols; sugars (e.g., melibiose) and starches; sugar and starch derivatives (e.g., alkoxylated glucose, fructose, glucosamine); hyaluronic acid; lactamide monoethanolamine; acetamide monoethanolamine; panthenol; allantoin; and mixtures thereof. Also useful herein are the propoxylated glycerols described in U. S. Patent No. 4,976,953, to Orr et al, issued December 11, 1990.

Also useful are various C_1-C_{30} monoesters and polyesters of sugars and related materials. These esters are derived from a sugar or polyol moiety and one or more carboxylic acid moieties. Such ester materials are further described in, U. S. Patent No. 2,831,854, U. S. Patent No. 4,005,196, to Jandacek, issued January 25, 1977; U. S. Patent No. 4,005,195, to Jandacek, issued January 25, 1977, U. S. Patent No. 5,306,516, to Letton et al, issued April 26, 1994; U. S. Patent No. 5,306,515, to Letton et al, issued April 26, 1994; U. S. Patent No. 5,305,514, to Letton et al, issued April 26, 1994; U. S. Patent No. 4,797,300, to Jandacek et al, issued January 10, 1989; U. S. Patent No. 3,963,699, to Rizzi et al, issued June 15, 1976; U. S. Patent No. 4,518,772, to Volpenhein, issued May 21, 1985; and U. S. Patent No. 4,517,360, to Volpenhein, issued May 21, 1985.

Preferably, the conditioning agent is selected from urea, guanidine, sucrose polyester, panthenol, dexpanthenol, allantoin, and combinations thereof.

Thickening Agent

The compositions of the present invention can contain one or more thickening agents, for example clays, gums, polymeric thickeners. When present, the compositions preferably provide from about 0.1% to about 5%, more preferably from about 0.1% to about 4%, and still more preferably from about 0.25% to about 3%, by weight of the composition of the thickening agent.

Composition Preparation

The compositions useful for the methods of the present invention are generally prepared by conventional methods such as are known in the art of making topical compositions. Such methods typically involve mixing of the ingredients in one or more steps to a relatively uniform state, with or without heating, cooling, application of vacuum, and the like.

The topical compositions of the present invention may be formulated as a facial skin cosmetic, eye cosmetic, lip cosmetic, scalp hair styling aid, facial hair styling aid, moisturizer, wrinkle soothing serum, lotion, mascara, spa product, body firming cream, cellulite reducing cream, skin facial mask, skin lotion, skin cream, skin gel, eye gel, eye cream, lip gel, lip cream, cosmetic, foundation, or any other commonly known skin product or treatment.

A multiple-step regimen may also be employed. For example, an adhesive elastomeric polymer basecoat may be applied and then the oil-soluble film-forming polymer in solution be applied either in combination with the basecoat application or after a brief drying period. Additionally, a dual-barrel or dual-pipette system may be implemented in which the oil-soluble film-forming polymer is applied from one barrel and the adhesive elastomeric polymer is applied from another barrel.

Methods of Use

The compositions of the present invention are useful for modifying the appearance of skin and hair. Modifying the appearance of hair includes styling scalp hair, eyelashes, eyebrows, beard and/or mustache. A preferred use of the compositions of the present invention is the curling of eyelashes by application of the compositions herein with a suitable implement e.g., a eyelash wand, or with the fingers.

Modifying the appearance of skin includes reducing the appearance of fine lines and/or wrinkles on the skin, reducing the appearance of eye bags and dark circles under the eys, sagging skin, scars/marks, dimples, pores, stretch marks, roughness, skin surface blemishes, frown lines, expression lines, rhytides, blemishes, photodamage, crevices, and/or unevenness.

In some embodiments of the present invention, the modification of the appearance of skin and/or hair may be enhanced by the addition of a skin or hair active. Examples of skin care actives that may be added to compositions of the present invention include vitamin B3 compounds (e.g. niaicinamide), panthenol and panthenoic acid, vitamin E compounds (e.g. tocopherol acetate), and retinoids (e.g. retinyl propionate). Regulation of the keratinous tissue conditions of the skin with such actives in combination with the oil-soluble film-forming polymer and adhesive elastomeric polymer can include prophylactic and therapeutic regulation. For

example, such regulating methods are directed to thickening keratinous tissue (i.e., building the epidermis and/or dermis layers of the skin and where applicable the keratinous layers of the nail and hair shaft) and preventing and/or retarding atrophy of mammalian skin, preventing and/or retarding the appearance of spider vessels and/or red blotchiness on mammalian skin, preventing and/or retarding the appearance of dark circles under the eye of a mammal, preventing and/or retarding sallowness of mammalian skin, preventing and/or retarding sagging of mammalian skin, softening and/or smoothing lips, hair and nails of a mammal, preventing and/or relieving itch of mammalian skin, regulating skin texture (e.g. wrinkles and fine lines), and improving skin color (e.g. redness, freckles).

In a preferred embodiment, the composition further includes a chronic active, such as niacinamide, and the composition is chronically applied to the skin. By "chronic topical application" is meant continued topical application of the composition over an extended period during the subject's lifetime, preferably for a period of at least about one week, more preferably for a period of at least about one month, even more preferably for at least about three months, even more preferably for at least about six months, and more preferably still for at least about one year. While benefits are obtainable after various maximum periods of use (e.g., five, ten or twenty years), it is preferred that chronic application continue throughout the subject's lifetime. Typically applications would be on the order of about once per day over such extended periods, however application rates can vary from about once per week up to about three times per day or more.

A wide range of quantities of the compositions of the present invention can be employed to provide a skin appearance and/or feel benefit. Quantities of the present compositions which are typically applied per application are, in mg composition/cm^2 skin, from about 0.1 mg/cm^2 to about 100 mg/cm^2. A particularly useful application amount is about 1 mg/cm^2 to about 10 mg/cm^2.

Modifying and/or regulating skin appearance, feel, and/or condition is preferably practiced by applying a composition in the form of a skin lotion, cream, gel, foam, ointment, paste, emulsion, spray, conditioner, tonic, cosmetic, lipstick, foundation, nail polish, after-shave, or the like which is preferably intended to be left on the skin or other keratin structure for some esthetic, prophylactic, therapeutic or other benefit (i.e., a "leave-on" composition). After applying the composition to the skin, it is preferably left on the skin for a period of at least about 15 minutes, more preferably at least about 30 minutes, even more preferably at least about 1 hour, still more preferably for at least several hours, e.g., 12 hours. Any part of the external portion of

the face, hair, and/or nails can be treated, e.g., face, lips, under-eye area, eyelids, scalp, neck, torso, arms, hands, legs, feet, fingernails, toenails, scalp hair, eyelashes, eyebrows, etc. The composition can be applied with the fingers or with an implement or device (e.g., pad, cotton ball, applicator pen, spray applicator, and the like). The compositions, after drying on the skin and/or hair may be "refreshed" or "touched-up" by directly applying additional amounts of the composition to areas in need of treatment.

Another approach to ensure a continuous exposure of the skin to at least a minimum level of the composition is to apply the compound by use of a patch applied, e.g., to the face. Such an approach is particularly useful for problem skin areas needing more intensive treatment (e.g., facial crows feet area, frown lines, under eye area, and the like). The patch can be occlusive, semi-occlusive or non-occlusive and can be adhesive or non-adhesive. The composition can be contained within the patch or be applied to the skin prior to application of the patch. The patch can also include additional actives such as chemical initiators for exothermic reactions such as those described in U.S. Patents numbered 5,821,250, 5,981,547, and 5,972,957 to Wu, et al. The patch is preferably left on the skin for a period of at least about 5 minutes, more preferably at least about 15 minutes, more preferably still at least about 30 minutes, even more preferably at least about 1 hour, still more preferably at night as a form of night therapy.

The composition according to the invention can be packaged in its own bottle. It can also be packaged in two separate receptacles, each receptacle containing either the film-forming polymer or the elastomeric polymer. The separate receptacles may provide ease in application or product formulation. The separate receptacles may also allow the consumer to control the level of physical stress on the skin (and resulting wrinkle-reduction benefit) achieved by a particular application.

Examples

The following examples further describe and demonstrate embodiments within the scope of the present invention. The examples are given solely for the purpose of illustration and are not to be construed as limitations of the present invention, as many variations thereof are possible without departing from the spirit and scope of the invention.

Examples 1-7

Skin Serum

Component	Percent Composition						
Chemical Name	Ex. 1	Ex. 2	Ex. 3	Ex. 4	Ex.5	Ex.6	Ex.7
Trimethylsiloxysilicate [1]	5	10	20	3	0.1	10	8
Styrene-Isoprene Elastomer [2]	5	5	5	7	4	10	4
Styrene-Acrylate Elastomer [3]	-	-	4	-	-	-	2
Sodium polystyrene sulfonate [4]	-	-	-	-	3	-	-
Water	-	11.93		-	22.9	20	6
Tocopheryl Acetate [5]	-	1	-	-	-	1	-
Retinol [6]		0.07	-	-	-	-	-
Niacinamide [7]	-	2	-	-	-	4	-
Isododecane [8]	90	70	20	79	60	55	80
Ethylene-Acrylate [9]	-	-	6	11	10	-	-

[1] Available from General Electric as SR1000 Resin.

[2] Available from Shell Oil Company as Kraton LVSI, neat.

[3] Available from B.F. Goodrich as Hystretch 43, a 50wt% aqueous latex.

[4] Available from National Starch as Flexan130, a 28wt% aqueous solution or Versaflex 5000 powder.

[5] Available from BASF as Vitamin E Acetate.

[6] Available from Roche as Vitamin A Alcohol.

[7] Available from Roche as Niacinamide No. 69905

[8] Available from Presperse Corporation as Permethyl 99A.

[9]Available from Kobo as EA209 pigment powder beads.

Making instructions:

1. All oil soluble ingredients are combined into solvents (e.g. Retinol, Styrene-Isoprene Elastomer into Permethyl) at 100-500 rpm at 25°C-45°C to form an oil phase.
2. Then the water based ingredients are dispersed into water at <100 rpm low shear mixing to form a water phase.
3. Then the water phase is mixed into the oil phase with high shear mixing >1000 rpm.
4. Then the particle materials such as pigment are added at the end of the batch.

After application of the composition to the skin, an excellent, aesthetically-pleasing wrinkle-reducing effect was obtained.

Examples 8-13

Skin Lotion

Component	Percent Composition					
Chemical Name	Ex. 8	Ex. 9	Ex. 10	Ex. 11	Ex. 12	Ex.13
Trimethylsiloxysilicate [1]	4	10	20	3	0.1	10
Styrene-Isoprene Elastomer [2]	5	3	5	7	4	10
Styrene-Acrylate Elastomer [3]	-	-	5	-	-	-
Sodium Polystyrene Sulfonate [4]	-	-	-	-	3	-
Isododecane [5]	87	80.95	57	50	55	55.95
Water	-	-	10	-	34.9	-
Ethylene-Acrylate [6]	-	5	-	-	-	-
Dimethicone Copolyol [7]	-	-	-	11	-	5
Dimethicone [8]	-	-	-	14	-	8
Retinol [9]	-	0.05	-	-	-	0.05
Tocopheryl Acetate [10]	-	1	-	2	-	2
Niacinamide [11]	-	-	-	5	3	-
Panthenol [12]	-	-	-	1	-	-
Nylon-12 [13]	-	-	-	7	-	4
Hectorite [14]	4	-	3	-	-	5

[1] Available from General Electric as SR1000 Resin.

[2] Available from Shell Oil Company as Kraton LVSI, neat.

[3] Available from B.F. Goodrich as Hystretch 43, a 50wt% aqueous latex.

[4] Available from National Starch as Flexan130, a 28wt% aqueous solution or Versaflex 5000 powder.

[5] Available from Presperse Corporation as Permethyl 99A.

[6]Available from Kobo as EA209 pigment powder beads.

[7]Available from Dow Corning as DC5225C.

[8]Available from Dow Corning as DC200 fluid.

[9] Available from Roche as Vitamin A Alcohol.

[10] Available from BASF as Vitamin E Acetate.

[11] Available from Roche as Niacinamide No. 69905

[12] Available from Roche as DL-Panthenol No. 63915.

[13] Available from Lipo as Orgasol pigment powder beads.

[14]Available from Southern Clay Company and Waverly as Laponite XLS, Laponite XLG

Making instructions:

1. All oil soluble ingredients are combined into solvents (e.g. Retinol, Styrene-Isoprene Elastomer into Permethyl) at 100-500 rpm at 25°C-45°C to form an oil phase.
2. Then the emulsifiers and thickeners (when present) are added to the oil phase and mixed at 500 rpm.
3. Then the water based ingredients (when present) are dispersed into water at <100 rpm low shear mixing to form a water phase.
4. Then the water phase is added into the oil phase with high shear mixing >1000 rpm.
5. Then the particle materials such as pigments are added at the end of the batch.

After application of the composition to the skin, an excellent, aesthetically-pleasing wrinkle-reducing effect was obtained

Examples 14-15

Lash Curling Mascara

Component	Percent Composition	
Chemical Name	Ex. 14	Ex. 15
Trimethylsiloxysilicate [1]	20	10
Styrene-Isoprene Elastomer [2]	10	10
Isododecane [3]	35	10
Isohexadecane [4]	15	40
Polyethylene [5]	10	19
Hectorite [6]	-	1
Black Iron Oxide	10	10

[1] Available from General Electric as SR1000 Resin.

[2] Available from Shell Oil Company as Kraton LVSI, neat.

[3] Available from Presperse Corporation as Permethyl 99A.

[4] Available from Presperse Corporation as Permethyl 101A.

[5]Available from Allied Signal as Acumist B-6 powder.

[6]Available from Southern Clay Company and Waverly as Laponite XLS, Laponite XLG

Making instructions:

1. The oil soluble ingredients are dissolved into solvents (e.g. Kraton into Permethyl) under low shear mixing and at 25°C-45°C to form an oil phase.
2. Then the solid particles (such as pigment, polyethylene, hectorite) are added to the oil phase with high shear mixing >500 rpm.

After application of the composition to the eyelashes, an excellent, smudge-resistant colorant and lash curl benefit was obtained.

Examples 16-18

Wrinkle Reduction Foundation

Component	Percent Composition	
Chemical Name	Ex. 16	Ex. 17
Trimethylsiloxysilicate [1]	5	15
Styrene-Isoprene Elastomer [2]	5	8
Sodium Polystyrene Sulfonate [3]	1	-
Water	10	-
Dimethicone Copolyol [4]	7	-
Dimethicone [5]	9	-
Red Iron Oxide	1	2
Yellow Iron Oxide	2	3
Titanium Dioxide	3	2
Isododecane [6]	53.93	70
Tocopheryl Acetate [7]	1	-
Retinol [8]	0.07	-
Niacinamide [9]	2	-

[1] Available from General Electric as SR1000 Resin.

[2] Available from Shell Oil Company as Kraton LVSI, neat.

[3] Available from National Starch as Flexan130, a 28wt% aqueous solution or Versaflex 5000 powder.

[4]Available from Dow Corning as DC5225C.

[5]Available from Dow Corning as DC200 fluid.

[6] Available from Presperse Corporation as Permethyl 99A.

[7] Available from BASF as Vitamin E Acetate.

[8] Available from Roche as Vitamin A Alcohol.

[9] Available from Roche as Niacinamide No. 69905

Making instructions:

1. All oil soluble ingredients are combined into solvents (e.g. Retinol, Styrene-Isoprene Elastomer into Permethyl) at 100-500 rpm at 25°C-45°C to form an oil phase.
2. Then the emulsifiers and thickeners (when present) are added to the oil phase and mixed at 500 rpm.
3. Then the water based ingredients (if present) are dispersed into water at <100 rpm low shear mixing to form a water phase.
4. Then the water phase is added into the oil phase with high shear mixing >1000 rpm.
5. Then the particle materials (such as pigments) are added at the end of the batch.

After application of the composition to the skin, an excellent, aesthetically-pleasing wrinkle-reducing and aesthetically-pleasing even skin tone effect was obtained.

Examples 19-20

Lip Color

Component	Percent Composition	
Chemical Name	Ex. 21	Ex. 22
Trimethylsiloxysilicate [1]	15	20
Water	-	5
Styrene-Isoprene Elastomer [2]	9	18
Retinol [3]	0.05	0.07
Niacinamide [4]	-	1
Isododecane [5]	67.95	39.93
Ethylene-Acrylate [6]	-	6
Red Iron Oxide	8	10

[1] Available from General Electric as SR1000 Resin.

[2] Available from Shell Oil Company as Kraton LVSI, neat.

[3] Available from Roche as Vitamin A Alcohol.

[4] Available from Roche as Niacinamide No. 69905

[5]Available from Presperse Corporation as Permethyl 99A.

[6] Available from Kobo as EA209 pigment powder beads.

Making instructions:

1. All oil soluble ingredients are combined into solvents (e.g. Retinol, Styrene-Isoprene Elastomer into Permethyl) at 100-500 rpm at 25°C-45°C to form an oil phase.
2. Then the water based ingredients (when present) are dispersed into water at <100 rpm low shear mixing to form a water phase.
3. Then the water phase is added into the oil phase with high shear mixing >1000 rpm.
4. Then the particle materials (such as pigments) are added at the end of the batch.

After application of the composition to the lip area, an excellent, aesthetically-pleasing wrinkle-reducing and firming effect was obtained

What is claimed is:

1. A topical personal care composition safe and effective for modifying the appearance of skin or hair, comprising:

a) from about 0.1% to about 70%, by weight of the composition, of an oil soluble film-forming polymer having a Tg of greater than 25°C;

b) from about 0.1% to about 70%, by weight of the composition, of an oil soluble adhesive elastomeric polymer having a Tg of less than 40°C; and

c) from about 1% to about 99.8%, by weight of the composition, of a dermatologically acceptable carrier for the oil-soluble film-forming polymer and the oil-soluble adhesive elastomeric polymer.

2. A composition according to claim 1 wherein the film-forming polymer is selected from the group consisting of alkyds, shellacs, polystyrene, organosiloxane resins, and mixtures thereof.

3. A composition according to claim 2 wherein the film-forming polymer is an organosiloxane resin.

4. A composition according to claim 3 wherein the film-forming polymer is selected from the group consisting of organosiloxane resins comprising $R_3SiO_{1/2}$ units and SiO_2 units, wherein R is a methyl group, and mixtures thereof.

5. A composition according to claim 4 wherein the film-forming polymer is poly(trimethylsiloxysilicate).

6. A composition according to claim 1 wherein the elastomeric polymer is selected from the group consisting of styrene-isoprene elastomers, styrene-butadiene elastomers, styrene-ethylene/propylene-styrene elastomers, styrene-ethylene/butylene-styrene elastomers, terminal hydroxylated polyethylene/butylene elastomers, ethylene-propylene elastomers, random thermoplastic elastomers, polystyrene-co-polyethylenepropylene elastomers, and mixtures thereof.

7. A composition according to claim 6 wherein the elastomeric polymer is a linear copolymer, branched copolymer, random copolymer, branched copolymer, block copolymer, di-

block copolymer, tri-block copolymer, multi-block copolymer, grafted copolymer, or star-shaped copolymer.

8. A composition according to claim 1 wherein the carrier is a volatile organic solvent.

9. A composition according to claim 7 wherein the solvent has a solubility parameter of from about 5 to about 25 and wherein the film forming polymer and the elastomeric polymer are soluble or dispersible in the solvent.

10. A composition according to claim 9 wherein the solvent has a solubility parameter of from about 7 to about 15.

11. A composition according to claim 9 wherein the solvent is selected from the group consisting of aliphatic hydrocarbons, aliphatic alcohols, silicones, ketones, esters, alcohols, glycols, glycol ethers, aromatic hydrocarbons, and mixtures thereof.

12. A composition according to claim 11 wherein the solvent is selected from the group consisting of aliphatic hydrocarbons, cyclic silicones and mixtures thereof.

13. A composition according to claim 1 comprising from about 1% to about 40% of the film-forming polymer; from about 0.1% to about 40% of the elastomeric polymer; and from about 10% to about 90% of a carrier, said carrier comprising a volatile organic solvent.

14. A composition according to claim 1 wherein the composition is in a form selected from the group consisting of a facial skin cosmetic, eye cosmetic, lip cosmetic, scalp hair styling aid, facial hair styling aid, moisturizer, wrinkle soothing serum, lotion, mascara, skin facial mask, eye gel, eye cream, lip gel, lip cream, cosmetic, foundation, or mixture thereof.

15. A composition according to claim 1, wherein the composition further comprises an ionic polymer.

16. A composition according to claim 1, wherein the composition further comprises an inorganic colloid.

17. A composition according to claim 1, further comprising an elastomeric latex selected from the group consisting of styrene-acrylate elastomer latex, silicone elastomer latex, acrylic acid ester elastomer latex, styrene-butadiene elastomer latex, and mixtures thereof.

18. A composition according to claim 1 further comprising an agent for dispersing the polymers in the composition.

19. A composition according to claim 13, wherein the polymer dispersing agent is selected from the group consisting of nonionic surfactants, anionic surfactants, and mixtures thereof.

20. A composition according to claim 1, further comprising a skin care active selected from the group consisting of retinoids, vitamin B_3 compounds, vitamin E compounds, panthenol, titanium dioxide, salicylic acid, and mixtures thereof.

21. A method of improving the appearance of skin texture, color and/or firmness, comprising topically applying to skin in need of such treatment an effective amount of the composition of claim 1.

22. A method of curling eyelashes, comprising applying to eyelashes in need of such treatment an effective amount of the composition of claim 1.

23. A method of styling hair, comprising topically applying to hair in need of such treatment an effective amount of the composition of claim 1.

24. A cosmetic kit useful for improving the appearance of skin and/or hair, comprising:

a) a first component comprising:

(i) from about 0.1% to about 70%, by weight of the first component, of a film-forming polymer having a Tg of greater than 25°C; and

(ii) from about 10% to about 90%, by weight of the first component, of a volatile, organic solvent; and

b) a second component comprising:

(i) from about 0.1% to about 70%, by weight of the second component, of an elastomeric, adhesive polymer having a Tg of less than 25°C; and

(ii) from about 10% to about 90%, by weight of the second component, of a volatile, organic solvent.

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(71) Applicant: THE PROCTER & GAMBLE COMPANY [US/US]; One Procter & Gamble Plaza, Cincinnati, OH 45202 (US).

(72) Inventors: ALWATTARI, Ali, Abdelaziz; 9325 Winton Road, #7, Cincinnati, OH 45231 (US). RITCHIE, Carla, Jean; 2974 Acer Court, Hamilton, OH 45013 (US).

(74) Agents: REED, T., David et al.; The Procter & Gamble Company, 5299 Spring Grove Avenue, Cincinnati, OH 45217-1087 (US).

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Declarations under Rule 4.17:
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— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for all designations*

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(54) Title: PERSONAL CARE COMPOSITIONS CONTAINING POLYMERS

(57) Abstract: The present invention relates to skin care compositions containing an oil-soluble film-forming polymer and an oil-soluble adhesive elastomeric polymer and to methods of using such compositions to regulate the appearance of skin and/or hair. The compositions contain from about 0.1% to about 70% of an oil-soluble film-forming polymer having a Tg of greater than 25°C, from 0.1% to about 70% of an oil-soluble adhesive elastomeric polymer having a Tg of less than 40°C, and a dermatologically acceptable carrier.

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INTERNATIONAL SEARCH REPORT

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B. FIELDS SEARCHED

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IPC 7 A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 959 009 A (KONIK RICHARD A ET AL) 28 September 1999 (1999-09-28) column 2, line 19-48 claims	1-3,6-8, 11-14
A	US 5 985 258 A (ALWATTARI ALI ABDELAZIZ ET AL) 16 November 1999 (1999-11-16) claims	1

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
"&" document member of the same patent family

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Information on patent family members

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		WO 9922711 A1	14-05-1999
		US 6060072 A	09-05-2000
US 5985258 A	16-11-1999	US 5874072 A	23-02-1999

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